

K13m p2I

VOL. — 14

No. 1

Kansas State Manual Training Normal School

A COLLEGE FOR TEACHERS, EMBRACING ALL THE GENERAL,
INDUSTRIAL AND VOCATIONAL COURSES

BULLETIN OF TECHNICAL AND PRACTICAL COURSES

SEPTEMBER, 1918

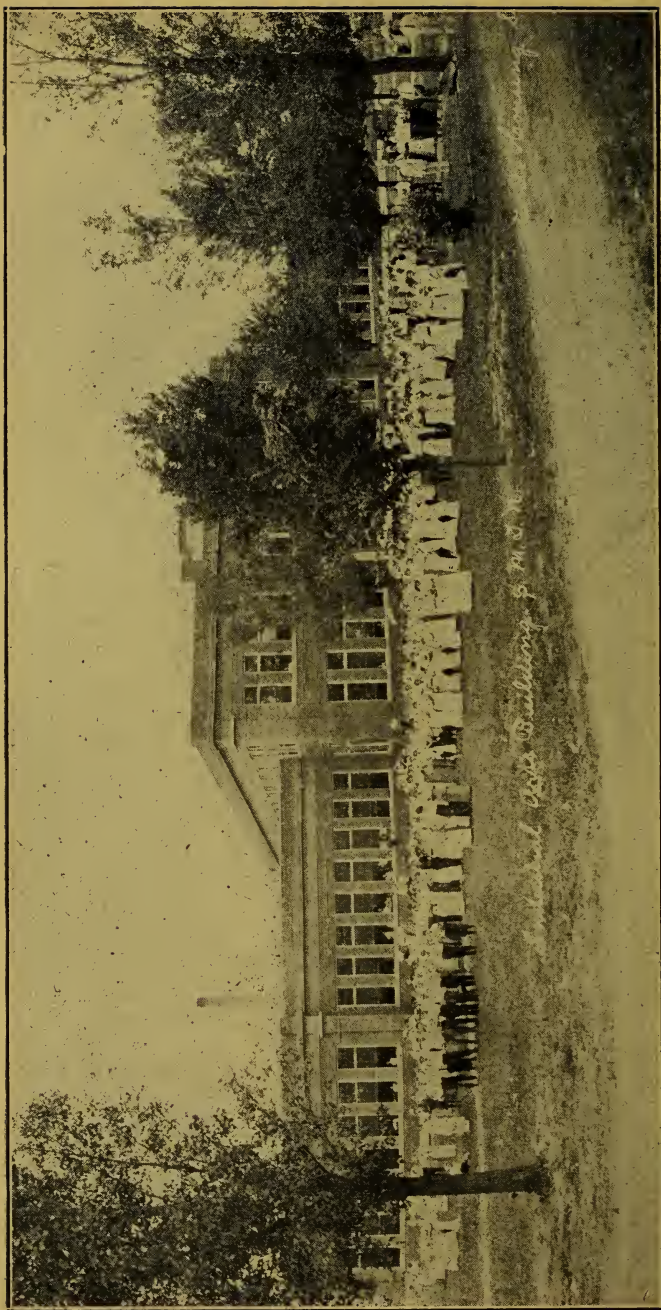
UNIVERSITY OF ILLINOIS
OCT 30 1918
Administrative Library

Published Quarterly
BY
STATE MANUAL TRAINING NORMAL SCHOOL
PITTSBURG, KANSAS

KANSAS STATE PRINTING PLANT
W. R. SMITH, STATE PRINTER
TOPEKA. 1918
7-3942

Entered May 6, 1905, at Pittsburg, Kan., as second-class matter, under act of Congress of July 6, 1904.

61-8161



Industrial Arts Building.

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CALENDAR, 1918-1919.

DAY CLASSES.

September 16, Monday	Entrance examinations.
September 17, Tuesday	Enrollment.
September 18, Wednesday	Beginning of class work.
November 18, Monday	Mid-semester term opens.
November 28-30	Thanksgiving vacation.
December 20, Friday	Work closes for 1918.
December 30, Monday	Resumption of first semester's work.
January 24, 1919, Friday	First semester's work closes.
January 27, Monday	Second semester opens with enrollment.
January 28, Tuesday	Beginning class work.
March 28, Friday	Commemoration day.
March 31, Monday	Mid-semester term opens.
April 29 to May 3	Annual musical festival.
May 18, Sunday	Baccalaureate sermon.
May 21, Wednesday	Commencement.
May 26, Monday	Summer session opens.
July 16, Wednesday	Summer session closes.

EVENING CLASSES.

September 30, Monday evening.....	Enrollment first term.
October 1, Tuesday evening.....	Beginning of class work.
December 20, Friday evening.....	Work closes for 1918.
January 6, Monday evening	Enrollment second term.
January 7, Tuesday evening	Beginning of class work.
March 31, Tuesday evening.....	Work closes for second term.

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THE SECRET OF SUCCESS.

By THOMAS DREIER.

The secret of success is not a secret. Nor is it something new. Nor is it something hard to secure. To become more successful, become more efficient. Do the little things better. So work that you will require less supervision. The least supervision is needed by the person who makes the fewest mistakes. Do what you can do and what you should do for the institution for which you are working, and do it in the right way, and the size of your income will take care of itself. Let your aim ever be to better the work you are doing. But remember always that you can not better the work you are doing without bettering yourself. The thoughts that you think, the words that you speak, and the deeds you perform are making you either better or worse. Realize with Henley that you are the master of your fate and the captain of your soul. You can be what you will to be. Forget yourself in rendering service to others. If an employee, strive to make yourself of greater value to your employer. Look upon yourself as a manufacturer. Think of yourself as being in business for yourself. Regard yourself as a maker and seller of service, and ever bend your thought and your energies toward the improvement of your product. The wise manufacturer never injures his machinery willfully. Your body, your mind, your soul serve as your plant. Eat and drink only that which will nourish your body, entertain only those thoughts that will enrich your mind, and if you feed your body with the best physical food and your mind with the best mental food you will build up a service factory that will find its products in constant demand. The world is hungry for quality service. It wants to pay for it. It is paying for all it can get. The market is not crowded. There is a chance for you right now. There is a chance for you right where you are. The time to start is now. Your reward will take care of itself.

Industrial Faculty.

W. A. BRANDENBURG, President.

LYLE BROWER, Professor of Drawing and Design.

G. W. TROUT, Professor of History and Social Sciences.

JAMES A. YATES, Professor of Chemical and Physical Sciences.

JOHN W. FUHRER, Director of Physical Education.

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A. H. WHITESITT, Director of Industrial and Applied Arts.

F. H. DICKINSON, Instructor in Pattern Making and Foundry.

E. F. SHOLTZ, Director of Department of Commerce.

C. R. WASSER, JR., Instructor in Cabinetmaking and Drawing.

MARY B. HILL, Instructor in Commerce.

R. H. MARSHALL, Assistant Professor of Mathematics.

C. O. VAN DYKE, Assistant Professor of Mathematics.

R. W. ERSKINE, Instructor in Machine Shop.

———, Instructor in Carpentry.

———, Instructor in Telegraphy.

———, Instructor in Plumbing.

———, Instructor in Sheet Metal.

———, Instructor in Automobile Repairing.

———, Assistant Professor of Physical Science.

WILLIAM H. MATTHEWS, Instructor in Physical Science.

INTRODUCTORY.

New conditions make new demands. It is the business of education to equip men and women for the most efficient and most satisfactory life for both society and themselves. The great war situation has revealed the fact that our country is greatly in need of many more men and women skilled along technical and trade lines than is now or than was available, even when Germany started the present war. To meet this demand this institution, without respect to training for the teaching profession, is offering many courses of strictly technical nature for the preparation of men and women for technical positions; and it is also offering similar courses in order that men and women already engaged in trade, industry and business may have opportunity for increasing their efficiency.

In the face of our greatly increased cost of living, man must constantly utilize his leisure hours, at least to acquire that knowledge which will place him on higher and higher levels of service; thus conserving his hope, increasing his salary, and securing more of economic independence. Not a member of the faculty of this institution is paid a penny in addition to his regular salary for the services which he is glad to render, especially in evening or extra day classes, to enable the institution to carry on this splendid work.

Last year 615 were enrolled, mostly men, in these classes in strictly evening school. The demand seemed so great that the faculty asked the Board of Administration to approve a plan for more numerous and more extensive courses for the coming year. This the Board has done, gladly giving their strong indorsement to the plan and policy. We expect at least 1,500 men to enroll in both day and evening classes during the current year.

Look this bulletin over and note the extent of the work offered, and possibly you will discover some courses that you would like to take up.

A few months' preparation in any one of a number of these courses will put you in a splendid and paying position.

Instructors and Instruction.

In every case the instructors are men of practical experience and skill, fully competent to teach the best modern methods and theory.

The scheme of instruction provides for extensive practice with the tools of the trades offered, for such instruction in drawing, mathematics, applied science, and trade theory as may be necessary to enable the students to read blue prints, make calculations, and understand in a general way the natural laws governing their work.

All regular students in the day school are required to attend classes in the supplementary subjects, and those in the evening classes are advised to if the need seems to justify it.

Qualifications for Admission.

The regular day school is open to men and to boys over fourteen years of age.

Persons over sixteen years of age who are regularly employed during the day are permitted to enroll in the evening classes. The term "evening school work" is considered to mean school work given to persons at hours other than those of actual employment. The term is descriptive of the kind of work rather than of the particular time of day when the class is in session. Persons working in the night shifts can be taught in classes held in the morning or afternoon and be regarded as evening instruction.

Length of Course.

The work as planned covers a period of two years.

The instruction is almost wholly individual, and a student's progress depends almost entirely upon his previous education and experience, his aptitude for the trade he has chosen, and his diligence. The school aims primarily at thoroughness, and students are required to follow the courses as outlined.

The only exception to this rule will be made in the case of mature students who have already made a beginning at their trades before entering the school and who can remain for only a part of the year.

School Sessions.

The school year runs from September to May, inclusive, and is divided into terms as follows:

DAY CLASSES.

First Term: September 16 to January 24.

Second Term: January 27 to May 21.

EVENING CLASSES.

First Term: October 1 to December 20.

Second Term: January 6 to March 31.

Attendance.

It is taken for granted that every student will attend regularly and work diligently, for only by being present and working diligently can one expect to accomplish the work laid out in any given course.

Any student who because of circumstances unavoidable is obliged to withdraw before a course is completed will receive credit for work satisfactorily done.

Certificates of Graduation

Each student, when he has completed the prescribed work in his course, will be given a certificate of graduation. Those who are compelled to leave the school before completing the prescribed course will, upon request, receive a statement of the work completed while in attendance.

Trade Courses.

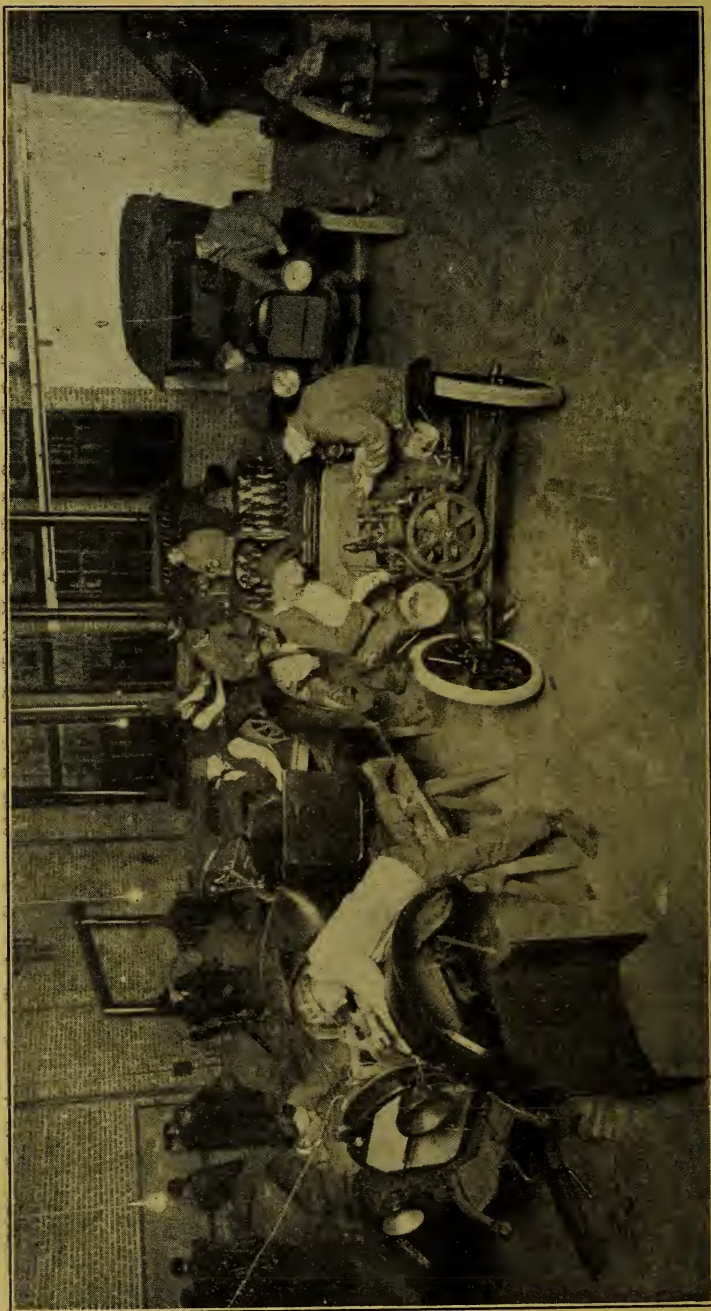
The need for thorough and systematic instruction in the theory and practice of the trades is generally conceded. Employers and employees alike are coming to recognize that a properly conducted trade school can and does offer a better preparation for industrial efficiency than can be obtained by working at a trade commercially. The difficulties in the way of giving adequate instruction in the workshops are greater than ever at this time, when thousands of skilled mechanics are in the military and naval service, and at no time have the opportunities for technically trained men been so promising.

Many of these vacancies in the industries created by the exigencies of war are being filled by the older boys, hence from all parts of the country come reports of a greatly decreased school attendance in all grades above the grammar. The temptation is strong. Jobs are easy to get and wages are high, even for unskilled labor. The necessity of manufacturing immense quantities of supplies in the shortest possible time has used up the usual surplus of unemployed older men.

The opportunities are tempting to the young man, but they are more or less deceptive and are likely to be of short duration, for while the boy of high-school age is at work, other men but little older are getting a training in the army and navy discipline that calls forth all the energy and ambition latent within them. Many of these men serving their country are already highly trained in the sciences, mechanics, engineering, and manufacturing or some other branch of industry. So when the end of the war comes, and peaceful industry supplants the maddened and inflated war industries, there will be an increased demand for highly trained men—educated men and those possessing technical knowledge. At that time those who drifted into the industries without technical training are going to be forced out by the young man who knows more because he has had the proper training. So it is the purpose of the State Manual Training Normal to make it possible for those who have been tempted into industrial pursuits, because the demand was insistent and the wages alluring, to increase their efficiency, to make more secure their present position, and to prepare for the shaking-down process that is sure to come at the close of the world conflict. This may be done in evening classes, part-time classes, or in the regular day classes. What are the few immediate dollars worth beside the later and larger successes that may come as the result of this appeal?

For full particulars write

W. A. BRANDENBURG, *President*,
STATE MANUAL TRAINING NORMAL SCHOOL,
PITTSBURG, KAN.



Class in automobile repairing.

DESCRIPTION OF COURSES.

Automobile Repairing.

_____, Instructor.

Practice is given in valve grinding and timing. Fitting pistons and piston rings. Taking up connecting rod bearings and crank shaft bearings. Carburetor adjustment. Repair of transmission and differential gears and their purpose. Brake adjustments. Oiling systems. Clutch adjustment. Cooling system. Theory of gasoline mixtures.

Automobile Electricity.

_____, Instructor.

Lecture and practice work.

Subjects treated are: Ignition, high- and low-tension distribution, condenser, timers, vibrators, interrupter, distributor, coils, magnetos, batteries, generators, automatic circuit breaker, voltage regulation, starting motors.

Practice work is given in vibrator and interrupter adjustment, timing, battery repair, generator repair and trouble hunting.

Armature Winding.

_____, Instructor.

Practical training in armature winding. Subjects treated are fundamentals of electricity, A. C. and D. C., generators, motors, transformers, lap and wave windings, delta and star connections, pitch, commutators, wire sizes.

Practice work on all types of machinery will be given.

Carpentry.

_____, Instructor in Carpentry.

LYLE BROWER, Instructor in Architectural Drawing.

R. H. MARSHALL, Instructor in Mathematics.

The work offered in this trade consists of instruction in Carpentry, Joinery, Cabinetmaking, Stair Building, and Mill Work. Students work from drawings and blueprints throughout, and the aim is to give a thorough foundation in all the fundamental processes of wood working. Early in the course opportunity is given the student to specialize in those branches of the trade that are of most value to him.

SHOP WORK.

FIRST YEAR.

First Term. Includes a study of tools—as uses, names of parts, adjustments, their care, and how to sharpen; the making of a few important joints, as lap mortise and tenon, gaining and dovetailing and their application in making useful projects.

Second Term. A study of materials and fastenings—nails, screws, bolts, stirrups, etc. Practical use of joinery exercises in framing sills,

plates, girders and ties, and fitting braces. Work on the various wood working machines. Tool grinding. Setting up machines.

Third Term. Making window and door frames, porch and cornice work; exterior decoration; making and setting forms for reinforced concrete construction.

SECOND YEAR.

First Term. Balloon framing, timber framing, rafter framing, truss framing, laying joist and framing headers, etc. Setting of partitions, etc.

Second Term. Interior finish, such as jamb casing, baseboarding, mode of laying out ordinary straight stairs. Laying out winders. Kerfing stringers. Laminating stringers, risers and other bent work. Method of laying out and working hand railing for platform, quarter turn and winding stairways. Fitting and hanging doors and windows. Putting on hardware.

Third Term. Erecting buildings and full-sized sections of buildings in the school shop.

Lectures. During the entire course occasional lectures are given on such subjects as the following: Care of edged tools. The various woods used in building. Glue, nails, screws, bolts, pins, straps, and other fastenings. Setting up the various woodworking machines, their use and care. The steel square. Various building ordinances.

The mathematics emphasizes measurements of lumber, and cubic contents and geometrical problems involved in roof framing, stair building, and the use of the steel square. Estimates.

Course 2—MATHEMATICS FOR CARPENTERS. Review of fundamental operations of arithmetic, common and decimal fractions, powers and roots, percentage, measures and weights; forces in structures; fundamental concepts of geometry; angle measurements; trigonometry of the right triangle as applied to framed structures; estimating costs; and uses of the steel square.

The drafting accompanying the carpentry course covers: Use of drafting instruments, lettering and sketching, orthographic projection. Details of simple cabinet work, window and door frames, sash and interior finish. Working drawings, consisting of scale plans, elevations and sections of houses. Tracing and blue-printing.

Carpentry Drawing.

LYLE BROWER, *Instructor.*

FIRST YEAR.

First Term. Use of drawing materials, sketches of simple projections, free-hand lettering—use of architectural lettering, sketches of house plans. Framing details—sills, joists, studs, corner posts, rafter ends, etc. Window and door detail.

Second Term. Sketches of plan for small cottage. Detail framing plan for cottage. Plan of cottage to $\frac{1}{4}$ " scale. Framing plans for elevations. Tracing and blue-printing. Materials and quantities.

Third Term. Sketches for plan of two-story house. Stair layout and stair detail. Framing plans and elevations. Elevations of exterior. Cost.

SECOND YEAR.

First Term. Original plan for residence. Study of arrangement of rooms. Locations of fixtures in kitchen and bathroom. Heating and lighting. Sanitation.

Second Term. Elevations for original design for residence. Tracing and blue-printing of architectural plan. Estimate of materials and cost.

Third Term. Detail drawings of interior finish and built-in fixtures. Building laws and contracts.

Electricians' Course.

———, Instructor.

For men wishing to become more proficient in the trade.

Subjects treated are: Fundamentals of electricity, A. C. and D. C.; electrical circuits for house wiring; electrical appliances and fixtures; theory of lighting and light distribution; the underwriters' code; city ordinance; contracting specifications.

Practice work will be given in wire splicing, pipe and molding bending, and in knob and tube, cleat, conduit, and metal and wood molding wiring.

A Course for Miners.

This is a practical course for all who are interested in mining. The information contained is essential to operator, manager, superintendent, foreman, fire boss or digger. It is essential that the men who are engaged in this extremely important industry know thoroughly the very best methods of operation and the safest and most economic way to get the coal to the surface. A complete understanding and practice of the science involved in this work will greatly lessen the accidents which occur in our Kansas mines, give the men underground better working conditions, purer air to breathe and less liability to accident.

Emphasis is placed upon the practical side of the work—"Use the head as well as the muscle." The course includes the following: Courses in mine gases and ventilation, timbering, explosives and haulage, together with the mathematics and sciences involved in the work of the miners and those directly engaged in this industry.

Fuel Administration.

This course is for firemen and those interested in the economic and smokeless combustion of coal. The course is designed to give such information to those who burn coal as to make them use it most economically. A study of the ash, smoke and combustible gases as very commonly seen in all our heating and industrial plants will show that there is a considerable percent of waste of coal. A thorough knowledge of the combustion of the coal used and the principles of combustion employed will enable those who use coal to get the largest possible number of heat units therefrom. In this time of war, when every ounce of our energy ought to be conserved, and with our coal shortage, it is of much importance that every possible waste should be eliminated. Lectures and suggested readings, together with demonstrations to illustrate the principles involved, are given. It is expected that those who take the course will find its application in the work they have to perform, and the hope is that by use of the principles of chemistry employed the man will be able, through the use of his head as well as his hands, to obtain the highest possible results.



Extension group in stationary engineering and group in mining at Scammon. Total enrollment: stationary engineers, 23; mining, 22.

Machine Shop.

R. W. ERSKINE, Instructor in Machine Shop Practice.
C. P. WASSER, Instructor in Machine Drawing.
R. H. MARSHALL, Instructor in Mathematics.

The instructions in this course of machine-shop practice provide for the thorough training of the student who wishes to become a competent, all-round machinist.

This course consists of shop work and instructions in a practical way. Students work from drawings and blueprints.

FIRST YEAR.

First Term. Drill-press work. Simple forging. Use of all common tools and their construction. Laying out, drilling, chipping, filing, tapping and threading with taps and dies. The proper use of all measuring instruments.

Second Term. Tool dressing and tempering, shaper, planer, lath and milling-machine work.

Third Term. Elementary tool grinding and a continuation of Nos. 1 and 2 of various kinds of machine work. Leveling and aligning of different kinds of machine equipments.

SECOND YEAR.

First Term. Work on drill press, shaper and planer. Advanced lathe work, including centering up, chucking, faceplate work, turning and boring straight and taper. Size and form turning, milling machine work, end, slab and gang milling.

Second Term. Vertical and horizontal shaping and planing work. Use of grinding machine on external and internal work, straight and angular. Floor work, compound and differential indexing, spiral cutting, etc.



Extension class for firemen and engineers.

Third Term. Review of all machine and bench work. Tool making and milling-machine work.

Instructions throughout the course in forge work, hardening and tempering. Care of belts, machine-shop material, emery wheels, threads and methods. Grinding and classification of steel. Design and use of gigs, punches and dies.

APPLIED MATHEMATICS.

Course 1—MATHEMATICS FOR MACHINISTS. Review of fundamental operations of arithmetic, common and decimal fractions, powers and roots, percentage, measures and weights, pulleys and belting, tooth gearing, elementary mechanics. The use of the simple equation and algebraic formulæ; fundamental concepts of geometry; centers of gravity; triangle and parallelogram of forces; stresses and strains; angle measurements; trigonometry of the right triangle and its applications to shapes of threads, taper turning, and work on the milling machine. A study of machine motions.

Machine Drawing.

CHAS. R. WASSER, Instructor.

FIRST YEAR.

First Term. Use and care of drawing instruments. Free-hand lettering and use of standard letters. Exercise work in use of drawing instruments, such as triangles, T-square, etc. Simple projections.

Second Term. Projections and revolution of solids. Free-hand sketching. Use of cross-section paper. Simple drawing of machine parts. Study of materials as related to cross-hatching.

Third Term. Geometrical problems in relation to trades, their application to shopman and draftsman. Threads, bolts, nuts, and hand-wheel details, etc.

SECOND YEAR.

First Term. Advanced conventions. Tracing and blue-printing. Measuring, sketching and carrying to completion machine parts, such as bearings, pulleys, simple gears, hand wheels, vises and gas-engine parts.

Second Term. Drawing related to direct shop work, such as making complete drawing with all details. Woodworking machines. Drill-press or speed lathe.

Third Term. Gearing—involute and cycloidal. Cams and motions. Making assembly drawings from details. Elementary design work. Use of handbooks, etc.

Pattern Making.

F. H. DICKINSON, Instructor in Pattern Making.

C. R. WASSER, Instructor in Drafting.

R. H. MARSHALL, Instructor in Mathematics.

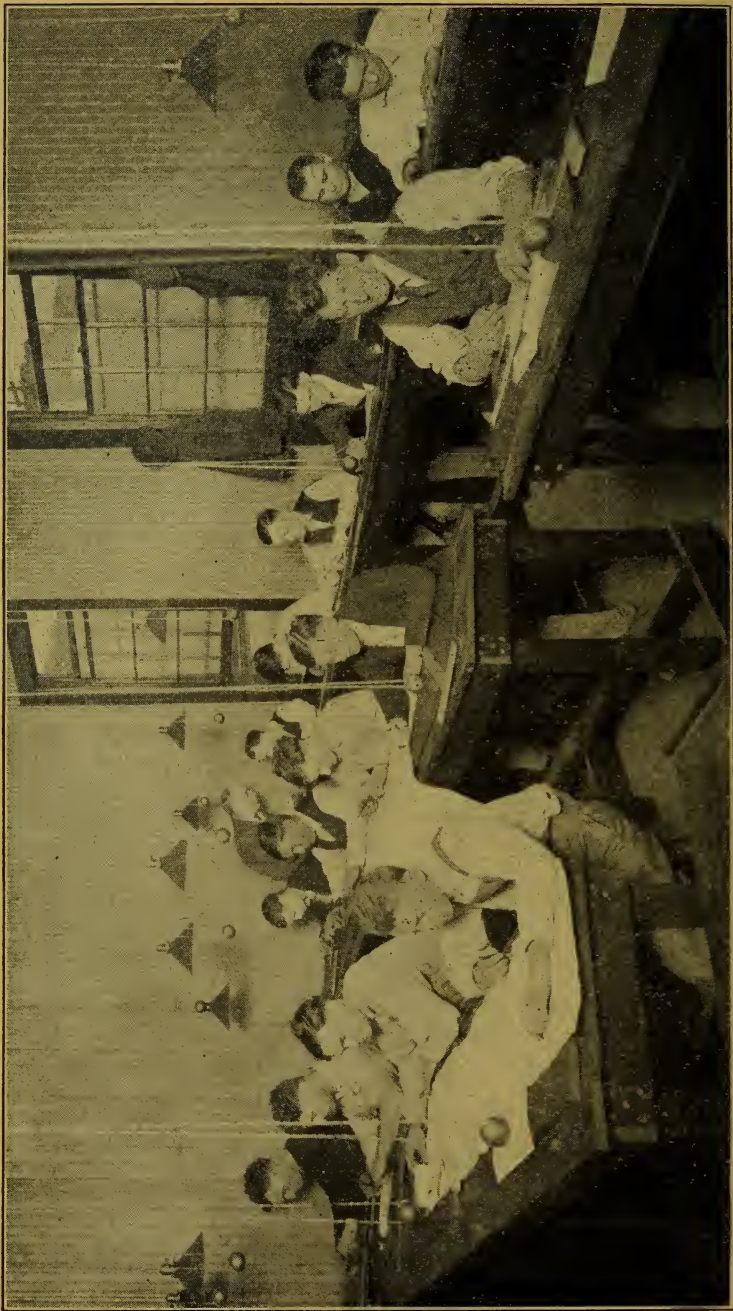
This course is designed for those who may wish to begin at the beginning and for those who already know something about the trade and who wish to take up advanced types of work. The instruction throughout emphasizes the relation between pattern shop and foundry. Students work from drawings and blueprints throughout.

FIRST YEAR.

First Term. Care and use of bench tools, such as saws, planes, chisels, squares, boring tools, clamping devices, fasteners, etc. Molding of sim-



Evening class for machinists.



Extension groups in drafting, Kansas City Southern railway shops, conducted by S. M. T. N.

ple patterns. Demonstrations showing results of back draft, tight dowel pins, and tight dovetailed loose pieces. Core making.

Second Term. Materials. Kinds and special qualities of woods used for successful patterns. Metals and their characteristics. Simple patterns. Wood turning; use of lathe, spindle turning, faceplate and chucking processes.

Third Term. Laying out patterns. Segment work. Hand wheels, and general pattern work combining lathe and bench work. Lectures on core work and general foundry practice.

SECOND YEAR.

First Term. Built up patterns, including choice and preparation of stock. Pipe and cylinder body, and pulley patterns.

Second Term. Spur, bevel, and worm gearing.

Third Term. Construction of patterns for complete machine.

MATHEMATICS. Special instruction in calculation of tapers, screws, pitch of bevel, worm, and spiral gears; laying out involute and epicycloidal teeth; screw propellers; shop algebra and trigonometry applicable to laying out work and setting machinery.

APPLIED MATHEMATICS.

Course 1.—**MATHEMATICS FOR PATTERN MAKERS.** Review of fundamental operations of arithmetic, common and decimal fractions, powers and roots, percentage, measures and weights, pulleys and belting, tooth gearing, elementary mechanics. The use of the simple equation and algebraic formulæ, fundamental concept of geometry, centers of gravity, triangle and parallelogram of forces, stresses and strains, angle measurements, trigonometry of the right triangle and its applications to shapes of threads, taper turning, and work on the milling machine. A study of machine motions.

Plumbing.

_____, Instructor in Plumbing.
 LYLE BROWER, Instructor in Drafting.
 R. H. MARSHALL, Instructor in Mathematics.

The instruction in this department is given by a practical plumber whose experience is varied and extensive. Instruction is given by practical work in the shop and by talks and lectures on the theory of the trade.

The shop instruction includes both plumbing and gas fitting. It begins with carefully planned exercises in making cup joints, overcast joints and seams; in wiping horizontal joints, vertical joints, and branch joints on lead pipe and brass nipples; in mixing and purifying solder; and in bending and forming lead pipe and sheet lead into traps, service boxes, etc.

Following this is the fitting of brass and galvanized-iron pipe; and later practice in thread-cutting, pipe bending, and testing of steam, gas and water pipe systems for defects and leakage.

The course also includes calking and making joints on cast-iron soil and drain pipe; roughing for lavatories, bathrooms, and kitchens.

The mathematics covers such matters as capacity of pipes and boilers, cubic contents of tanks and cisterns, and estimating cost.

The drafting accompanying the plumbing course covers floor plans and sections of buildings, with the putting in of complete plumbing layouts.

This is a course which should appeal strongly to those who contemplate the learning of the trade and those who are already employed as helpers and who wish to obtain as rapidly as possible complete knowledge of the plumbing trade.

Telegraphy.

This course is intended for those desiring to become operators, and others interested in different phases of this subject.

RADIO. A practical course in sending and receiving messages by means of the ordinary telegraph key and buzzer. Instruction is given in the international code, and is intended to help the student for service in the signal corps of the United States army.

MORSE TELEGRAPHY. A course is also given in American Morse code for both young men and women wishing to qualify themselves for positions in railroad and commercial service.



Evening class in telegraphy. The instruments are loaned to the institution by the United States government.

INDUSTRIAL ENGINEERING COURSES.

In addition to the trade courses previously described, the institution offers courses in Automobile, Civil, Electrical, Mechanical and Mining Engineering for those who are ambitious to fill positions above the grade of skilled mechanics in mines and manufacturing and industrial plants. A superintendent or manager must have a more thorough training in the theoretical side of the subject. This must be preceded by a more extensive course in mathematics and science than is necessary for trade instruction.

Men who have had the advantage of considerable experience along the line of the course that they wish to enter will generally find that their preparation is sufficient. In the absence of extensive practical experience, the completion of a full high-school course is recommended. In all cases



One of many extension groups in mining.

emphasis is laid on the maturity and general fitness of the student rather than upon his having passed certain courses prescribed for entrance.

The courses are designed for two years' work for the industrious and capable students. A diploma is granted to those who complete satisfactorily any of the two-year courses. Certificates are given, however, at the completion of any one subject, these being statements that the student was in attendance while the subject was being given, and that his work was satisfactory.

THE LIBRARY.

All students have access to the school library, in which will be found a collection of trade and technical periodicals and reference works of especial value to those engaged in industrial pursuits.

EQUIPMENT.

The institution possesses sufficient apparatus of a technical nature to offer up-to-date instruction in each of the courses named. This is constantly being added to in order that it may more completely meet the needs of the classes. The shops and drafting rooms are large and well equipped for such shop work as is required, and the laboratories contain much material specially purchased for practical instruction. The aim of the mathematics and science departments has always been to emphasize the practical side of their courses; accordingly their equipment has been selected for the value it may possess in teaching the applications of the theoretical principles discussed in the class rooms.

Industrial Automobile Engineering Course.

FIRST YEAR.

First Semester :

Industrial Mathematics.
Wood Turning, Pattern Making and
Foundry.
Machine Drawing.
Chemistry I.
Gas Engines.
First Aid.

Second Semester :

Industrial Mathematics.
Electrical Machinery.
Forging, Bench Metal and Elementary
Machine Shop.
Machine Drawing.
Gas Engine Electricity.
First Aid.
Technical Report.

SECOND YEAR.

First Semester :

Mechanics and Heat.
Advanced Machine Shop and
Automobile Repairing.
Mechanism.
Testing of Oils.
Automobile Engines.

Second Semester :

Contracts and Specifications.
Strength of Materials.
Advanced Machine Shop and
Automobile Repairing.
Welding.
Tire Repairing.
Troubles and Remedies.
Technical Report.

Industrial Civil Engineering Course.

FIRST YEAR.

First Semester :

Industrial Mathematics.
Elementary Surveying.
Wood Turning, Pattern Making and
Foundry.
Machine Drawing.
Chemistry I.
First Aid.

Second Semester :

Industrial Mathematics.
Forging, Bench Metal and Elementary
Machine Shop.
Machine Drawing.
Mine Surveying.
Strength of Materials.
Elementary Steam Power Plants.
First Aid.
Technical Report.

SECOND YEAR.

First Semester :

Mechanics and Heat.
Topographical Surveying.
Mechanism.
Plumbing.
Mine Gases and Ventilation.
Geology.

Second Semester :

Railroad Surveying.
Contracts and Specifications.
Hydraulics.
Sanitation and Water Supply.
Electrical Machinery.
Sewers, Roads and Pavements.
Technical Report.

Industrial Electrical Engineering Course.

FIRST YEAR.

First Semester :

Industrial Mathematics.
Gas Engines.
Wood Turning, Pattern Making and Foundry.
Machine Drawing.
Chemistry I.
First Aid.

Second Semester :

Industrial Mathematics.
Electric Wiring.
Electrical Machinery.
Forging, Bench Metal and Elementary Machine Shop.
Machine Drawing.
First Aid.
Technical Report.

SECOND YEAR.

First Semester :

Mechanics and Heat.
Electrical Measurements.
Plumbing and Pipe Fitting.
Mechanism.
Armature Winding.
D. C. Machinery Design.

Second Semester :

Elementary Surveying.
Gas Engine Electricity.
Contracts and Specifications.
Elementary Steam Power Plants.
Illumination.
A. C. Machinery.
Technical Report.

Industrial Mechanical Engineering Course.

FIRST YEAR.

First Semester :

Industrial Mathematics.
Gas Engines.
Wood Turning, Pattern Making and Foundry.
Machine Drawing.
Chemistry I.
First Aid.

Second Semester :

Industrial Mathematics.
Strength of Materials.
Elementary Surveying.
Forging, Bench Metal and Elementary Machine Shop.
Machine Drawing.
Elementary Steam Power Plants.
First Aid.
Technical Report.

SECOND YEAR.

First Semester :

Mechanics and Heat.
Thermodynamics.
Advanced Machine Shop.
Machine Design.
Plumbing and Pipe Fitting.
Mechanism.

Second Semester :

Refrigeration.
Electrical Machinery.
Hydraulics.
Gas Engine Electricity.
Contracts and Specifications.
Steam Turbines.
Technical Report.

Industrial Mining Engineering Course.

FIRST YEAR.

First Semester :

Industrial Mathematics.
Gas Engines.
Wood Turning, Pattern Making and Foundry.
Machine Drawing.
Chemistry I.
First Aid.

Second Semester :

Industrial Mathematics.
Forging, Bench Metal and Elementary Machine Shop.
Machine Drawing.
Elementary Surveying.
Qualitative Analysis.
Strength of Materials.
First Aid.
Technical Report.

SECOND YEAR.

First Semester:

Applied Mechanics and Heat.
 Plumbing and Pipe Fitting.
 Quantitative Analysis.
 Mine Gases and Ventilation.
 Geology.
 Mine Surveying.

Second Semester.

Electrical Machinery.
 Elementary Steam Power Plants.
 Contracts and Specifications.
 Mineralogy.
 Explosives.
 Mine Surveying.
 Technical Report.

DEPARTMENT OF APPLIED MATHEMATICS.

This department offers the larger number of subjects in the Industrial Civil Engineering course, and the Industrial Mechanical Engineering course. Many of the same subjects are included, however, in the other Industrial Engineering courses.

Industrial Civil Engineering Course.

Civil Engineering has to do with the planning, locating, and construction of public works such as bridges, railroads, hydraulic plants; with municipal improvements such as sewer systems, paving, drainage, parks, and waterworks; and with the measuring and mapping of lines both on the surface of the ground and beneath the surface. This latter type of work is known as mine surveying, and the course as outlined covers the essentials of this type of surveying. Civil Engineering includes several different classes of work, and the purpose of the course offered at this institution is to get acquainted with the elements of the main types of work so that the student may make a wise selection of the field in which he wishes to specialize.

Industrial Mechanical Engineering Course.

Mechanical Engineering embraces the design, construction and operation of machinery. The many new inventions make the mechanical engineer a factor of growing importance in the world's work. In order to become efficient in this vocation, a foundation of mathematics, science, and drafting must be obtained. In addition to these subjects which enable the student to think correctly and express his ideas by means of drawings, a definite training along some special lines of machinery must be secured. Generally steam engineering is the more important type of mechanical engineering because of the universal use of steam machinery and refrigerating machinery. All of these subjects are included in the course as outlined, giving the student an appreciation of the relation of the various kinds of machinery whose operation is under the charge of mechanical engineers.

Course 10.—INDUSTRIAL MATHEMATICS I. A course in the fundamental principles of algebra, geometry and trigonometry which are necessary to the study of engineering subjects. Considerable emphasis is placed upon graphical work throughout the course. Practical problems are selected from the trades and different types of engineering, and include the mathematics of power transmission, pulleys, belts, gearing, metal working, pattern making, foundry work, tapers, cutting speeds and thread proportions.

Course 11.—INDUSTRIAL MATHEMATICS II. A continuation of course 10, with less emphasis on trade problems and more on those of engineering. The slide rule is taken up in connection with logarithms. Elementary mechanics, graphs of the principal trigonometric functions, approximate

methods of determining areas of curves by graphic methods, Simpson's rule, and planimeters.

Course 12.—**STRENGTH OF MATERIALS.** A study of the physical properties of materials used in the construction of buildings and machinery; the stresses and corresponding deformations of these materials in tension, compression, and shear; the principles underlying the investigation and design of pipes and cylinders carrying internal fluid pressure; riveted joints; beams and columns; shafting and reinforced concrete, resilience of materials.

Course 13.—**MECHANISM.** A study of the motion of machine parts and of methods of transmission of motion by means of links, belts, gears, and cams. This work is related closely to the machine motions used in the steam engine and various shop machines.

Course 20.—**ELEMENTARY STEAM POWER PLANTS.** A brief study of the general problems of steam power generation; fuels, combustion and steam generation; a study of boiler and engine types; engine mechanisms and power plant auxiliaries; laboratory practice in testing of steam machinery.

Course 21.—**THERMODYNAMICS.** The relation between heat and mechanical energy; theory of heat engines; the action of vapors under the influence of heat and pressure.

Course 22.—**STEAM TURBINES.** A special study of the different types of steam turbines with the auxiliary apparatus used with them. Inspection trips to the power plants using these different types of turbines.

Course 23.—**HYDRAULICS.** The study of the laws governing the action of liquids in pipes and their flow through pipes and over weirs. The types of pumping and hydraulic power machinery with special reference to the uses of pumps in removing water from mines.

Course 24.—**REFRIGERATION.** A study of the construction and operation of the principal types of refrigerating machinery as used in cold-storage plants and in the manufacture of artificial ice. Inspection trips to plants using these types of machinery.

Course 30.—**SURVEYING I.** A brief course in the use of surveyor's instruments; laying out of walks, drives, ditches, and buildings; calculation of cuts and fills; elements of land surveying.

Course 31.—**SURVEYING II.** A continuation of course 30, involving more advanced work in surveying; adjustment of instruments; topographical surveying; construction and care of roads.

Course 32.—**MINING SURVEYING.** This course takes up the location of points on the surface, such as wells, shafts, etc.; the carrying down of the surface surveys to the underground work and the running of underground lines and levels.

Course 33.—**RAILROAD SURVEYING.** A study of the methods used in laying out and constructing railways, with field practice sufficient to familiarize the student with these operations; calculation of waterways; laying out of bridges, turnouts and easement curves.

Course 34.—**SANITATION AND WATER SUPPLY.** A study of the problems of water supply for rural homes and cities, with special reference to the cities of Kansas; purification of water; types of water systems, sewer systems and sewage disposal. Lectures and inspection trips.

Course 35.—**SEWERS, ROADS AND PAVEMENTS.** An elementary course in the design and construction of sewers and storm drains. The collection and distribution of the water supplies, with more detailed discussions of the apparatus used in purifying water and sewage.

DEPARTMENT OF CHEMICAL AND PHYSICAL SCIENCES.

This department offers work to meet the needs of students taking any of the trade or industrial engineering courses. The department also offers the larger part of the work in the courses in industrial electrical engineering and mining engineering, as well as trade courses in mining, electrical workers' telegraphy, and fuel conservation. These courses are the outgrowth of the different practical courses given in chemistry, geology and physics, supplemented with like courses given by other departments of the institution.

The sciences of chemistry and physics have become recognized as being of great importance on account of their intimate relation with all manufacturing processes which involve transformation of substances, together with the application of the mechanical forces and various appliances.

Present world-wide events are more than ever emphasizing the part which chemistry and electricity play in the social welfare of the nation and the bearing these have on the many experiences of daily life so easily seen in noticing our surroundings. The plan in giving these courses is to make the worker efficient by being able to intelligently use the principles involved in the work he has to accomplish; in a word, to use his head in doing the task in the easiest, shortest and most economical way. The idea in each course is to bring to the worker the best ideas and the most economical way that is known by which his task may be accomplished. Stress is placed upon the ability to do the job quickly, thoroughly, and in a scientific way.

CHEMISTRY I. In this course the student becomes acquainted with the different materials and elements that are used in every industry. He studies the principles involved in the transformation of the different substances with which he works. The application of the principles of this fundamental science in all phases of work are stressed. Due emphasis is placed upon the applications of these principles to the different lines of trade or profession in which the student is engaged. Subjects included in this course are the gases, as oxygen, nitrogen, carbon dioxide, together with a description of the common metals, how they rust, protection of same; in a word, the chemical processes involved in converting raw material into finished products. Other subjects, as the study of acids, oils, paints, salts, etc., will be considered in a practical way in this course.

Courses for Miners and Those Interested in Mining.

Course 1.—MINE GASES AND VENTILATION. A beginning course in the study of the gases found in mines. The properties and tests for these gases will be thoroughly studied. These gases will be prepared in the classroom and various tests for them made. The safety lamp will be thoroughly studied, and its use in testing for the gases found in the mine. The origin and removal of the gases will receive attention. No effort will be spared in teaching the students in this course the practical side of this work. In ventilation the student will be taught how to get the necessary data and how to find the quality of the air in a mine, how to keep the quality of the air supply in the mine in proper healthful condition, also how to make the necessary measurements and calculations for the proper ventilation of mines.

Course 2.—AN ADVANCED COURSE IN MINE GASES AND VENTILATION. This course is built upon a knowledge of course 1, and is intended for those who have had course 1 or its equivalent. The course is in every way analogous to course 1, except it goes deeper into the principles involved.

Course 3.—A COURSE IN TIMBERING. This course includes timbering in working places, traveling and haulage ways. This is an important course, since an examination of the list of accidents which occur in mines shows a large percentage are caused by rock falls, many of which might be prevented by proper timbering. This course is especially valuable to those who are engaged in mining, because proper attention given to this subject will certainly eliminate many accidents.

Course 4.—EXPLOSIVES. This course deals with the explosives used in mining, their proper care and attention. The chemistry of explosives is studied in a practical way; also the causes that lead to explosions, and how these accidents may be avoided is carefully considered. In all these courses opportunity will be given for questions and discussions in order to find the best way to do the work in hand, and also to avoid accidents. The different methods of mining will receive their share of attention.

Practical Electricity.

Course 1.—ELEMENTARY PRACTICAL ELECTRICITY. Designed for men who desire to get a working knowledge of the handling and installing of electrical machinery and apparatus, such as electric lights, motors, transformers, starting boxes, etc. This course includes a study of Ohm's law, calculation of wire sizes, electric power bills, and transmission losses; power calculations on two- and three-wire direct-current systems, and three-phase and single-phase two- and three-wire systems of transmission and distribution; the wiring and operating of direct-current motors and alternating-current motors and transformers. Lectures, demonstrations and laboratory work.

Course 2.—DIRECT-CURRENT MACHINERY. A course for men interested in direct-current machinery. Designed to prepare men to be able to select, install and operate direct-current machinery of all types. It includes a study of generator and motor theory and operation. Special stress is to be laid on characteristics and efficiency of various types of machines as a basis for choice of machinery for special types of service. Problems in selection of proper sizes of machinery and transmission lines for special jobs will be worked. Lectures and demonstrations. Prerequisite, course 1 or its equivalent.

Course 3.—DIRECT-CURRENT MACHINERY LABORATORY. A course to follow course 2. A laboratory study of direct-current machinery characteristics and efficiencies. Students do all wiring and operating of machines. Prerequisite, course 2.

Course 4.—ALTERNATING-CURRENT MACHINERY. Designed to prepare men to be expert in the handling and selection of alternating-current equipment. The course consists of a study of the theory, construction and operation of generators, motors, transformers and starting equipment. All types of motors, such as induction, synchronous, split-phase, repulsion and series, will be studied. Transmission problems with special stress on the importance of power factor in alternating-current circuits will be worked and studied. Lectures and demonstrations. Prerequisite, course 1 or its equivalent. Course 2 is desirable as a preceding course.

Course 5.—ALTERNATING-CURRENT MACHINERY LABORATORY. A companion course to course 4. This is a laboratory study, including the wiring and operation of motors, transformers and starting equipment. Induction and single-phase motors are to be studied. The effect of capacity and inductance on power factors is one of the problems. Prerequisite, course 4.

TELEGRAPHY. A course for those desiring to become telegraphers, wire or wireless, for the government or for private companies. The Morse

code and International code are taught. Great emphasis is laid on the learning to receive.

A course in typewriting is offered in connection with telegraphy, so that telegraphers may learn to transcribe messages on the typewriter direct from the wire. The course is in charge of competent instructors who have had many years of practical experience in railroad and commercial service.

This course is offered to meet the need of telegraph operators, owing to the large number who have been taken into government service. This course is given in both day and evening classes when the demand warrants it.

ELECTRICAL MACHINERY. The theory of direct- and alternating-current machinery and its applications as found in the industrial world. It includes a study in the lecture room and laboratory of dynamos, motors, starting equipment, rectifiers, transformers, transmission lines, regulating devices, etc.

PLUMBING AND PIPE FITTING. A study of the fundamental principles of plumbing and pipe fitting and of modern sanitary appliances for the home. The course includes designs and practice work as well as recitations and lectures.

ELECTRIC WIRING. A practical course in the wiring of electric appliances and motors. It includes the study of the "code," the planning of jobs and making cost estimates on them, as well as the actual installing of "approved" circuits.

ELECTRIC WIRING II (ILLUMINATION). A continuation of course 23. A practical course in the designing of illumination distribution for all purposes—home, school, business house, and street lighting. It includes a study of the various types of light sources, shades, and reflectors and their adaptability for various classes of service.

ARMATURE WINDING. A practical course in the testing and repairing of defective and burned-out electrical machinery.

ELECTRICAL MEASUREMENTS. Lectures and laboratory, includes meter testing; the measurement of temperature coefficient of resistance; specific resistance of copper, iron, aluminum, etc.; the electrolysis measurement of copper; testing of iron for hysteresis and its measurement; the measuring capacity, inductance and earth's magnetic field; telephone line measurements; and wireless equipment measurement.

DIRECT-CURRENT MACHINE DESIGN. Lectures and design. The theory of direct-current machine construction. Includes the theory of magnet design, both shunt and series and armature design. Two practical problems are given, one the design of a lifting electro magnet, and the other the design of a direct-current motor.

ALTERNATING-CURRENT MACHINERY. Lectures, design and laboratory. Advanced alternating-current machinery and alternating-current machine design. Some of the higher problems of alternating-current machinery are taken up in this course, such as alternating-current transmission line calculations and inductive interference in alternating-current transmission lines, transfer men regulations, alternating-current generator, voltage regulators, etc.

A problem in the design of an alternating-current machine, either transformer, generator or motor, will be solved.

ELECTRICAL LABORATORY EQUIPMENT.

- 2....0-p5 A. C. Weston voltmeters.
- 1....0-300 A. C. Weston voltmeters.
- 1....0-75 A. C. Weston voltmeters.
- 1....0-30 A. C. Weston voltmeters.
- 1....0-100 A. C. Weston ammeter.

- 1....0-15 A. C. Weston ammeter.
- 1....0-5 A. C. Weston ammeter.
- 1....0-2 A. C. Weston ammeter.
- 1....0-215-25 D. C. Weston ammeter.
- 1....0-1.5-3-30 D. C. Weston ammeter.
- 1....0-3-30-300 D. C. Weston voltmeter.
- 1....100-0-100 D. C. Weston millivoltmeter.
- 1....0-7 Hat Wire ammeter.
- 2....1 kw. wattmeters.
- 2....Sangamo induction watt-hour meters.
- 1....Wall galvanometer.
- 5....Table galvanometers.
- 1....Post office bridge.
- 1....Slide wire bridge.
- 1....Standard inductance.
- 3....Standard resistance boxes.
- 2....Standard condensers.
- 1....Magnetometer.
- 1....High insulation discharge key.
- 2.... $\frac{1}{2}$ hp. G. E. repulsion induction motors, single phase.
- 1.... $\frac{1}{4}$ hp. Century single-phase motor.
- 1....1 hp. G. E. 3-phase induction motor.
- 1....Diehl $\frac{3}{4}$ hp. D. C. dynamo.
- 2....D. C. ignition megnetos.
- 2....Bell transformers.
- 3....Moloney transformers, 1 kw., 220-110/55.
- 2....Current transformers.
- 5....A. O. amp.-hr. Edison storage batteries.
- 2....6 volt lead storage batteries.
- 1....2 volt lead storage batteries.
- 1....Starting rheostat for D. C. motor.

In addition to these the laboratory is equipped with several machines for practice work in armature winding, including a dummy armature and a transformer.

Power available in the laboratory is 220-volt D. C. and three-phase 220 or 110 volt A. C. for use in electrical work; induction motors of various types; a D. C. generator; 7 kw. and D. C. lathe motors.

Gas Engines and Automobiles.

There has been growing among the operators and repairers of automobiles and gas engines a feeling that there has been too much guess-work in the operation and adjustment of gas-engine parts, and not enough "know." These courses are designed to fill the demand for bigger and better men who are already expert in their lines, and to make more competent and efficient workers of men already workers in this field.

Course 1.—GAS ENGINES. This course includes a study of the theory and operation of the engine, the cooling system, valves, poppet and knight sleeve valve, carburetors, Steward vacuum feed, planetary transmission, clutch, gear change, differential, etc. Lectures and demonstrations.

Course 2.—AUTOMOBILE ELECTRICITY. Study of ignition systems, battery and magneto, including spark coils, vibrators, spark plugs, timers, circuit breakers, condensers, distributors, their troubles and their care. This is followed by a study of batteries; repairing and charging of storage batteries; the generator and its controls, such as the relay and automatic cut-out; and last, the starting motor. Special stress is laid on locating and correcting troubles in circuits. Lectures and demonstrations.

Geology.

This course includes the study of the natural materials that are used in various industrial activities, their identification, manufacture and use. Such subjects as the distribution and supply of fuel and road-building materials are studied in this course.

MINERALOGY. This is a brief course in the study of our common rocks and minerals. Easy physical and chemical tests for identification, together with crystal structure, is studied. The relation of the different types of soil and water as found in our state to that of the geological formations is emphasized.

Contracts and Specifications.

This course will consist of the study of contracts and specifications with special reference to their legal phase as may be applied to the common interpretation of such contracts.

There is no intention to be technical but to give a broad, general knowledge so that the laboring man may understand his contract and its relation to the law.

Physical Education and First Aid.

There is a strong feeling current among workmen that a better and more complete knowledge of first aid to the injured should be extended to the worker and to laymen generally. The quick and complete recovery from accidents, in many cases, has depended on the skilled treatment given in the emergency, before the physician arrived to render his professional service. In order to help in giving a wider and more extended knowledge of the principles of first aid, the Department of Physical Education will give the course outlined below as an opportunity course.

FIRST AID. The object of this course will be to give such knowledge and training that men may, in cases of accident, render assistance to their fellow workman, reduce suffering from injuries, and in some instances save life. A brief study of the anatomy of the human body will be given. Instruction in the treatment of common injuries, including hemorrhage, shock, fractures, dislocations and sprains, is included. The use of the triangular and roller bandage, methods of transportation of the injured, and the various rescue methods will receive attention.

Commercial.

The work in this department is planned with the idea of preparing students for office work and extending an opportunity to those now in positions to make themselves more efficient.

The work is chiefly individual and the student may progress as rapidly as he is able to do the work.

Never before have there been such wonderful opportunities for business-trained students.

The government is offering salaries ranging from \$1,200 to \$1,400. Business firms cannot get efficient office help. Opportunity is knocking. Get ready.

The following business subjects are offered: Shorthand, Dictation, Spelling, Penmanship, Typewriting, Business English, Bookkeeping, Business Arithmetic.



Evening class in bookkeeping.



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